OPERATIONS AND MAINTENANCE PLAN
FOR POLYCHLORINATED BIPHENYLS
ESTABROOK ELEMENTARY SCHOOL
LEXINGTON, MASSACHUSETTS

Revision Two

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LIST OF ABBREVIATIONS AND ACRONYMS

Building	Estabrook Elementary School
EH&E	Environmental Health & Engineering, Inc.
EPA	U.S. Environmental Protection Agency
Estabrook	Estabrook Elementary School
ng/m^3	nanograms per cubic meter
O&M	operations and maintenance
PCB	polychlorinated biphenyl
PM	Project Manager
ppm	parts per million
School	Estabrook Elementary School
SOP	standard operating procedure
$\mu g/100\ cm^2$	micrograms per 100 square centimeters

1.0 PURPOSE AND OVERVIEW

1.1 INTENT

The purpose of the Estabrook Elementary School (Estabrook) Operations and Maintenance (O&M) Plan for polychlorinated biphenyls (PCBs) is to:

- Recognize, control, and mitigate potential PCB hazards at Estabrook.
- Ensure the continued health and safety of students, staff, visitors, contractors, vendors, and the community.
- Maintain compliance with occupational and environmental regulations pertaining to PCBs.
- Implement proactive maintenance activity reviews to identify work with the potential to disturb PCB-containing materials.
- Maintain air and surface concentrations of PCBs below established health based guidelines.
- Ensure adequate ventilation is provided to Estabrook.
- Specify environmental sampling schedules and plans.

1.2 OVERVIEW

This plan describes operations and maintenance procedures for the continued management and control of PCBs at Estabrook Elementary School (the School), Lexington, Massachusetts, prepared by Environmental Health & Engineering, Inc. (EH&E) for the Town of Lexington.

The following are the key tenets for the Estabrook O&M Plan:

- Potential exposure to airborne PCBs shall be controlled to as low as reasonably achievable, and comply with the current site specific risk assessment indoor air school year average value of 230 nanograms per cubic meter (ng/m^3).

- Potential exposure to PCBs in surface dust shall be controlled to as low as reasonably achievable, and in all cases surface dust PCB concentrations shall comply with the criteria set forth by the U.S. Environmental Protection Agency (EPA)

of 10 microgram per 100 cubic centimeters ($\mu g/100\ cm^2$), as well as a more stringent criteria of 1 $\mu g/100\ cm^2$ set by the EPA Region 1 PCB Coordinator.

- Potential exposure to PCBs on encapsulated surfaces shall be controlled to as low as reasonably achievable, and in all cases comply with criterion set forth by the EPA of 1 $\mu g/100\ cm^2$.

- All projects or work activities that may potentially disturb PCBs shall be evaluated by Lexington Facilities Management to determine if precautions are required (e.g., inspection, testing, abatement).

- Only qualified and trained personnel shall perform activities that will potentially disturb PCB-containing materials at Estabrook.

- Lexington Department of Facilities shall be responsible for ensuring that the associated program elements are observed.

- PCB awareness training will be provided to teachers, staff, and Lexington employees.

- PCB remediation and hazardous materials training will be provide to selected Lexington Department of Facilities employees.

- All Lexington staff, contractors, and vendors are responsible for reporting any condition or activity that could result in the disturbance of PCBs to Lexington Facilities Management.

- All accidental disturbances and/or releases of PCBs shall be reported immediately to Lexington Facilities Management for evaluation and follow up.

The following sections describe the PCB management program for Estabrook. Appendix A provides a listing of current key Lexington employees with responsibilities under this O&M Plan and their contact information. Appendix B includes an inventory summary of

identified and presumed materials that contain PCBs at Estabrook. Appendix C provides a revision history of this plan. Appendix D provides standard operating procedures for repairs and renovation activities. Appendix E provides the recommended HVAC operating procedures.

2.0 PROJECT BACKGROUND

Environmental Health & Engineering, Inc. (EH&E) performed an initial investigation in June 2010 to identify suspect PCB-containing caulking and sealants used throughout portions of the School. EH&E collected samples of exterior caulking and inspected the caulking for evidence indicating window caulking replacement or repair work. Five unique types of caulking were identified and sampled. One of the five types of caulking contained PCB concentrations between 6,000 and 21,000 parts per million (ppm). Photograph 2.1 depicts this caulking material and the typical installation detail between the metal window frame and brick façade. Photograph 2.2 depicts a typical section of the school façade.

Photograph 2.1 Typical Caulking Detail

Photograph 2.2 Typical Façade Section

In July of 2010 air samples for PCB homolog concentrations were collected in the School. Results indicated indoor air concentrations of total PCBs above the public health levels for annual average concentrations suggested by the EPA. In August of 2010, window glazing and sealants were also sampled to identify other potential sources of PCBs that may be contributing to the measured levels in the indoor air. The glazing and sealant samples contained concentrations of PCBs between 0.89 and 150 ppm.

In response to these findings, EPA was notified and the Town of Lexington conducted cleanup activities that included: removal of 550 linear feet of PCB containing caulking, decontamination of the non-porous metal window frame surface to less than or equal to 10 μg/100 cm^2, and encapsulation of the porous brick material with a two-part epoxy encapsulant. The remediation process also addressed the non-porous metal window frames by cleaning them to a post-abatement criterion of 10 μg/100 cm^2 or less.

Window sealant and glazing compounds on the interior and exterior of the School's windows were encapsulated using a two-part system comprised of bond breaker tape and silicone caulk. The bond breaker tape provided the necessary PCB barrier, and the silicone caulk provided the necessary adhering qualities and weatherization. Representative sections of the encapsulated areas were sampled using surface wipes to ensure the criterion set forth by the EPA of 1 μg/100 cm^2 or less was met.

Results of the post remediation wipe samples collected in August of 2010 and issued to EPA in a September 1, 2010, report indicated that representative sections of the encapsulated areas were all less than the criterion set forth by the EPA of 1 μg/100 cm^2. After remediation work activities had been completed and unit ventilators had run overnight for at least 10 hours, an additional round of air sampling was conducted. Results indicated that airborne concentrations still exceed the suggested public health levels provided by the EPA.

Based on these air sampling results, additional actions were implemented to improve indoor air quality in the school including steps to increase the amount of outdoor air ventilation. The testing also indicated that an additional source(s) of PCBs was present in the School and was contributing to the levels of PCBs observed in the indoor air. EH&E conducted further source characterization activities at the School intended to identify materials that were making a substantive contribution to indoor air PCB concentrations. This further source characterization included a detailed inspection of suspect materials such as ceiling tiles, light fixtures, unit ventilator components, paints, glues, mastics, and other interior sealant and adhesive materials and additional sampling of indoor air, surfaces, and/or bulk materials.

The next round of indoor air samples collected on September 6, 2010, indicated that modifications to the existing ventilation systems made to maximize delivery of outdoor air into the building substantially improved the levels PCBs in indoor air. Many rooms were below the public health targets suggested by EPA and the results demonstrated that indoor air levels could be partially managed through ventilation. At this same time, bulk sampling identified a narrow bead of caulk around interior seams of wall panels that were likely to be an important source of indoor PCBs. Photograph 2.3 depicts an example of this caulking bead. Ceiling tiles were identified as a secondary source of PCBs during this round of sampling and activities were planned to measure the impact of the ceiling tiles on indoor air PCB concentrations. Further, wipe samples collected from eleven indoor surfaces such as desk tops indicated concentrations all less than 1 μg/100 cm^2 suggesting that elevated levels of PCBs in source materials were not adversely impacting surface dust at the School.

Photograph 2.3 Caulking on Interior Panel within Window Frame

Prior to collection of the September 19, 2010, round of air samples, interior beads of PCB-containing caulk located below the ceiling plenum were encapsulated following the methodology accepted by EPA. Comparison of these post encapsulation test results to concentrations measured in the third round of sampling provided information on changes in indoor air levels of PCBs. The results of this round of testing demonstrated continued progress in controlling concentrations of PCBs in indoor air of the School. The concentrations of PCBs in indoor air were below 230 ng/m^3 in each room sampled on September 19, 2010. This result held even for the two rooms (13 and 24) in which the unit ventilators were operating with the outdoor air damper in the minimum open position.

Test conditions were then developed to evaluate the impact of the ceiling tiles on the indoor air PCB concentration at the School by isolating the ceiling tiles from the classroom with polyethylene sheeting. Results suggested that the indoor air concentrations when the ceiling tiles were isolated from the classroom were very similar to those observed prior to isolation of the ceiling tiles. The average PCB homolog air concentration in Round 5 was 155 ng/m^3. In comparison, the average concentration in the same rooms sampled during Round 4 was 151 ng/m^3. The results of this testing indicated that any emissions from ceiling tiles was not a substantive contributor to PCB levels in indoor air of these classrooms.

The results from the sixth round of testing collected on September 28 and 29, 2010 in Rooms 2 and 5 were consistent with previous measurements during periods of reduced ventilation. In contrast, the results for Room 1 and Room 6 indicated the influence of factors not directly related to ventilation. The effects of these factors on levels of PCBs in indoor air of the School warranted further investigation.

On October 18 and 19, 2010, two hypotheses were tested on sources and methods of mitigating PCBs remaining in indoor air of the school. The first hypothesis was that the release of PCBs from the curtain walls (window assembly) continued to contribute to PCB levels in indoor air. The second hypothesis was that there was a release of PCBs from within the unit ventilator cabinets contributing to PCB levels in indoor air. The hypotheses testing results indicated that the curtain walls continued to be a source of PCB emissions and that the PCB levels in indoor air could be managed further by sealing penetrations in components of the curtain wall and by minimizing the heating of caulk on the interior of the curtain wall. The test results also indicate that unit ventilators were not an important source of PCB levels observed in indoor air.

Based in part on these results, plans were made for additional near-term mitigation at the school that included sealing specific components of the curtain wall, suspending use of stand-alone steam radiators (i.e., radiators that are not integral to the unit ventilators), and encapsulating transite panels below the window sills of the curtain walls. This was achieved by constructing a mini-wall in each room to encapsulate the lower panels of the curtain wall thereby separating them from indoor air of the classroom. The mini-wall constructed in Room 6 is depicted in Photograph 2.4. In addition, I-beam chases were enclosed and specific areas related to the curtain wall were sealed with new caulk or foam insulation. Areas sealed included edges of the mini-wall, metal-to-metal joints of aluminum framing, and original caulking at the intersection of horizontal and vertical aluminum frames.

Photograph 2.4 Mini-wall Installed in Room 6

Mini-wall construction was completed throughout the school and was evaluated with multiple rounds of air sampling. A graphical summary of the PCB concentration measured in indoor air of Estabrook between July 22, 2010, and April 21, 2011, is provided in Figure 2.1. A total of 64 post mini-wall encapsulation air samples were collected, all under winter ventilation conditions. The mean indoor air PCB concentration based on these samples is 86 ng/m^3 with a range of less than 5.3 to 188 ng/m^3. These results demonstrate the effectiveness of the mitigation methods employed in Estabrook.

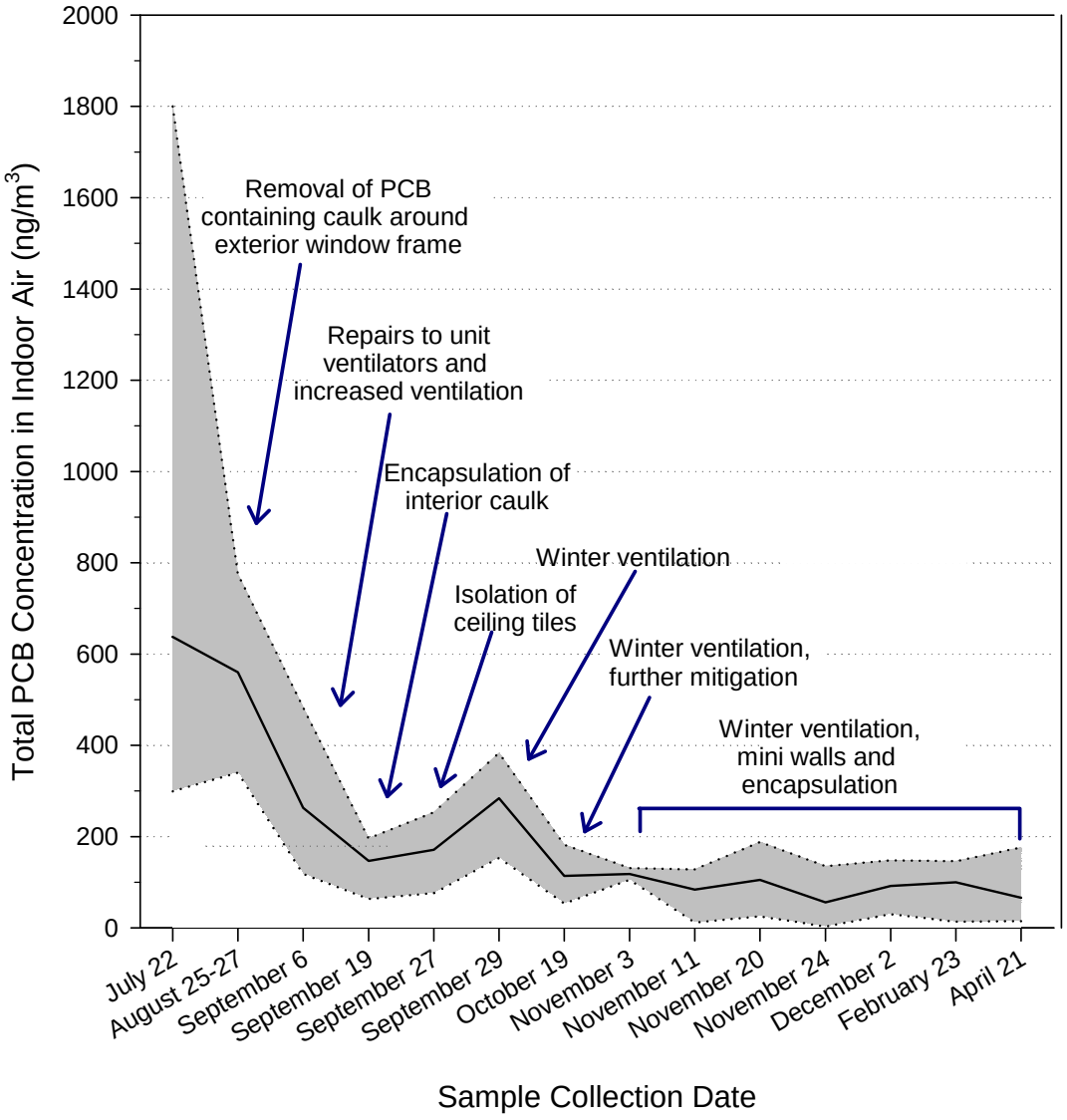

Figure 2.1 Average (line) and Range (shaded area) of Total PCB Concentration in Indoor Air over Time

The actions taken to date have reduced PCB exposures for staff and children to within the guidance values provided by EPA and the site-specific risk assessment. The Operations and Maintenance Plan described in this report was developed to ensure continued mitigation of potential risks associated with PCB in building materials at the School.

3.0 ROLES AND RESPONSIBILITIES

3.1 ROLES AND RESPONSIBILITIES

The Estabrook O&M Plan applies to the Estabrook Elementary School located at 117 Grove Street, Lexington, Massachusetts. This Plan applies to the following type of work:

- Planned renovations projects.
- In-house repairs, maintenance, and remodeling work that may disturb PCBs.
- O&M activities to maintain encapsulated PCBs in acceptable condition.
- Disposal of PCBs, if necessary.

3.2 LEXINGTON MANAGEMENT

Lexington recognizes that clearly defining the departmental roles and responsibilities, including mechanisms to track the various program elements, are critical to the success of the O&M Plan. Lexington has the responsibility of notifying all employees, contractors, and vendors who may work in areas with PCBs that these materials are present and managed as part of this O&M Plan.

The following sections outline Lexington management, O&M employees, and contractor roles and responsibilities under this program; current Lexington management personnel are listed in Appendix A.

3.2.1 PCBs Program Coordinator or Designee

The PCBs Program Coordinator or his/her designee has the following responsibilities:

- Audit compliance with Lexington policies and state and federal regulations pertaining to PCBs.
- Conduct annual reviews of the program.
- Coordinate PCB awareness training for Lexington personnel (e.g., teachers, staff, management, maintenance, cleaning).

- Outline and/or communicate the PCB-related training requirements for other Lexington personnel that may need training above the awareness level.
- Document that periodic surveillance is conducted of all known PCBs four times per year in February, April, August, and December.
- Document that periodic ventilation measurements are conducted four times per year in February, April, August, and December.
- Ensure an inventory of PCBs is maintained and updated.
- Respond to events involving the potential disturbance or release of PCBs.
- Coordinate air monitoring for exposure assessment purposes, three times per year in February, August, and November.
- Maintain PCB-related documentation.
- Be aware of, review, and approve all PCB-related tasks being performed at Estabrook.

3.2.2 Director of Project Management or Designee

The Director of Project Management and the individual Project Manager (PM) or their designees have the following responsibilities:

- Management of all PCB related tasks/responsibilities in the construction renovation process within their projects/areas.
- Schedule PCB inspections when required for projects.
- Ensure that contractors are aware of the Estabrook PCB policies prior to initiation of construction, renovation or maintenance activities.
- Notify the PCB Program Coordinator prior to the initiation of all PCB-related work activities at Estabrook.

3.2.3 Maintenance Managers or Designees

Maintenance Managers or their designees have the following responsibilities:

- Confirm that all O&M tasks that are conducted by maintenance and housekeeping are in compliance with Lexington policy.
- Ensure maintenance and housekeeping employees receive proper training in PCB hazards and O&M tasks.
- Report any PCB materials that may be damaged or have the potential to be damaged to the PCB Program Coordinator.
- Manage all PCB-related tasks/responsibilities during routine and emergency O&M activities.
- Ensure that contractors are aware of Lexington PCB policies prior to initiation of O&M activities.
- Notify the PCB Program Coordinator prior to the initiation of all PCB-related work activities at Estabrook.

3.3 OPERATIONS AND MAINTENANCE EMPLOYEES

Only trained Lexington employees may conduct work activities that disturb PCB containing material. However, some employees, including maintenance and custodial staff, will conduct O&M activities where PCBs may be present and have the following responsibilities:

- Inform their supervisors of any potential PCB material.
- Prevent the disturbance or removal of PCB material.
- Inform the PCB Program Coordinator of any potentially damaged PCB material.

At Estabrook, the removal and/or disturbance of PCBs will occur only during construction, renovation, emergency building system repairs, or when the material is found to be damaged or has the potential to be damaged. Only trained Lexington employees will engage in any work activity that disturbs, impacts or involves the removal of PCBs.

3.4 CONSULTANTS AND CONTRACTORS

Work activities that involve disturbing PCBs may also be conducted by approved, qualified, and licensed contractors and/or consultants. Lexington Facilities and PM Department personnel will maintain copies of contracts and licenses of personnel performing work on PCB-related projects in their office.

The following sections describe the roles and responsibilities of PCB contractors and consultants.

3.4.1 PCB Inspectors

When project specific PCB inspections are required, independent consultants will be used to inspect for PCBs within the designed area/project. The responsibilities of the PCB consultant include:

- Conduct the PCB inspection within the assigned area based upon industry guidelines and regulatory standards.
- Ensure that all samples are analyzed at accredited laboratories and comply with industry guidelines and regulatory standards.
- Report all PCB inspection results to their contact in the Facilities and Project Management Departments and/or the PCB Program Coordinator in a timely manner.

3.4.2 PCB Abatement Contractors

When PCB abatement activities require independent contractors to be used, the responsibilities of the PCB abatement contractors include:

- Conduct the PCB abatement within the assigned areas in accordance with industry guidelines and regulatory standards.
- Maintain all licenses and certifications required to conduct PCB abatement.
- Complete the required abatement closeout packages and return to their contact in the Facilities and Project Management Departments and/or the PCB Program Coordinator in a timely manner.

3.5 OTHER CONTRACTORS

3.5.1 General Contractors

Lexington's project general contractors (GCs) have numerous responsibilities in maintaining safe work environments at Estabrook during construction and renovation projects. GCs will generally not be directly involved with PCB abatement activities; however, renovation and demolition activities within projects shall occur subsequent to the PCB inspection and abatement activities when necessary. The project GCs responsibilities related to PCBs include:

- Avoid any activities that may potentially disturb PCBs (e.g., demolition) prior to the PCB inspections and abatement when necessary.

- Alert the PM and the PCB Program Coordinator immediately upon discovering that PCBs may have been disturbed or released. Assist in securing the area at the direction of the PM and PCB Program Coordinator.

3.5.2 Subcontractors

Project subcontractors are responsible for performance of their work related to all Lexington project requirements, including those regarding PCBs. Subcontractors of project GCs, will generally not be directly involved with PCB abatement. Renovations and demolition activities within projects shall occur after the PCB inspection and abatement activities.. The project subcontractor's responsibilities related to PCB include:

- Avoid any activities that may potentially disturb PCBs (e.g., demolition) prior to a pre-construction meeting, PCB inspections, and abatement, when necessary.
- Report the discovery of any suspect PCB material to the PCB Program Coordinator.
- Report any potential disturbance or release of PCBs to the PCB Program Coordinator.

4.0 PROGRAM ADMINISTRATION

4.1 TRAINING REQUIREMENTS

The following describes the required levels of training related to the O&M Plan. All Lexington employees and contractors who perform O&M activities in areas where PCBs are present shall receive general PCB awareness training. All outside contractors involved in PCB-related work must maintain all of the required training and licenses as required by state and federal regulations and guidelines pertaining to PCBs.

4.1.1 Operations Maintenance Staff and Contractors

Activities likely to disturb PCBs will be carried out only by the properly trained Lexington employees. However, maintenance and custodial staff may work in areas where PCBs are present. All contractors performing routine O&M that may unintentionally disturb PCBs are required to provide training for their employees in accordance with the following.

All maintenance or custodial staff (or other employees) who perform housekeeping or maintenance activities in areas where PCBs are present, will receive general PCB awareness training annually, typically 1 – 2 hours. Training will cover:

- Health and safety hazards of PCBs
- Location of PCBs at Estabrook
- Recognition of damaged or deteriorated PCB-containing materials
- Housekeeping standard operating procedures
- Response to potential PCB release episodes
- Overview of the Estabrook O&M Plan

4.1.2 Hazardous Materials Training

Activities likely to disturb PCBs will be carried out only by properly trained Lexington employees or qualified remediation contractors. The employees responsible for performing these maintenance activities will receive 40-hour Hazardous Waste Operations and Emergency Response Standard (HAZWOPER) training.

HAZWOPER training is for workers that perform activities that expose or potentially expose them to hazardous substances. The training is specifically designed for workers who are involved in clean-up operations, voluntary clean-up operations, emergency response operations, and storage, disposal, or treatment of hazardous substances. Topics include protection against hazardous chemicals, elimination of hazardous chemicals, safety of workers and the environment.

Table 4.1 summarizes the minimum training requirements for Lexington staff, contractors, and vendors who may work in areas where PCBs are present.

Table 4.1 Summary of Minimum PCB Training Requirements for Lexington Personnel

Personnel Category	Type of Training	Training Frequency
Specially Trained Maintenance Staff	HAZWOPER (40-hour training course)	Initial training with 8-hour refresher annually thereafter
Facilities Department Managers	Awareness level	Annual
Facilities Department Staff	Awareness level	Annual
Project Managers	Awareness level	Annual
Other Lexington personnel potentially involved in O&M activities (e.g., custodial)	Awareness level	Annual
Project General Contractors and Subcontractors	Awareness level	Annual

PCB polychlorinated biphenyl
HAZWOPER Hazardous Waste Operations and Emergency Response
O&M Operations and Maintenance

4.2 HAZARD COMMUNICATION

Lexington will notify contractor contacts/representatives of the presence of PCBs that the contractor's employees or subcontractors may contact. Lexington will ensure that the appropriate level and amount of information is available to affected staff, occupants, and visitors to Estabrook. The goal of the PCB hazard communication program is to provide the necessary information so that individuals can take the appropriate level of precaution to minimize potential exposures without unduly and unnecessarily alarming building occupants.

4.3 INVENTORY

Lexington will provide a list summarizing the types of locations that will be maintained by the PCB Program Coordinator. The list will also provide details including material type, location, approximate quantity, and condition of the PCB material, along with dates of inspection, sample collection, or abatement. Appendix B includes and inventory summary of identified and presumed PCBs at Estabrook.

4.4 INCIDENT REPORTING

Any incident, accident, or emergency where PCBs may have been released must be reported to the PCB Program Coordinator immediately. All response actions pertaining to the release are performed in accordance with all state and federal regulatory requirements for notification, clean-up, repair or removal.

4.5 INSPECTIONS

The PCB Program Coordinator will perform or designate qualified personnel to perform detailed inspections of PCB-containing materials at Estabrook four times per year (February, April, August, and December) or more frequently if conditions warrant. The primary goal of these inspections is to identify PCB materials that may be in a condition, such as significantly damaged, that it could pose a potential hazard and should be abated or repaired. The inspections will be documented and included as part of the Estabrook PCB inventory. The inspections will include location, quantity, and condition of PCB materials. Corrective actions will be performed as required to address any issues identified during the visual inspections.

4.6 RECORDKEEPING

The PCBs Program Manager or designee will maintain all records as related to PCBs at Estabrook.

4.7 PROGRAM REVIEW AND REVISION

The O&M Plan will be reviewed on an annual basis by the PCBs Program Manager, or the designated qualified personnel, to include changes in regulations and management processes at Estabrook. A review will also be performed of the PCBs inventory to assure that areas of Estabrook where PCBs exist are inspected routinely and records are maintained appropriately. All revisions to the O&M Plan will be recorded in Table C.1 of Appendix C.

5.0 PCB RELATED ACTIVITIES

5.1 PCB RELATED ACTIVITIES

Lexington manages PCBs related to two main types of activities: O&M activities and renovation activities. In general, O&M activities are managed by the Facilities Department and renovation activities are managed through the Project Management Department. O&M activities include routine maintenance of the Estabrook building systems and components. O&M activities are primarily conducted by the Lexington Maintenance Department. Some O&M activities are also conducted by the Custodial Department.

Renovation activities are construction related projects that include demolition and/or renovation of Estabrook. Renovation activities are managed by Lexington's Project Management Department and are primarily conducted by construction contractors (e.g., project general contractor and subcontractors).

5.2 OPERATIONS AND MAINTENANCE ACTIVITIES

All O&M tasks that may potentially disturb PCBs shall be reviewed for their impact on PCBs prior to conducting the task. Once reviewed, O&M tasks will include, where necessary, engineering and administrative controls to ensure that the tasks are conducted without disturbing the PCBs. Examples of O&M tasks that would potentially disturb PCBs may include, but are not limited to: removal of ceiling tiles, window repair activities, and any repair activities associated with curtain walls. The Facilities Department can develop and customize standard operating procedures (SOPs) for routine activities to facilitate this work. These procedures must be reviewed and approved by the PCB Program Coordinator. General SOPs for renovation and repair work and small response tasks are provided in Appendix D.

5.2.1 Maintenance Activities

O&M activities or routine activities performed by facilities maintenance personnel may involve situations where PCBs may be present, but not disturbed. Where these instances exist, the employee encountering the material must not contact, disturb or

work on or around the PCBs. The PCB Coordinator or Program Manager will review the work to be done, and ensure that, as warranted, appropriately trained personnel perform the work. Where possible, Lexington workers should:

- Avoid sweeping or dry brushing in classrooms (along curtain walls) where the presence of PCB-containing dust or debris is possible.
- Avoid cutting, drilling holes in, or sanding into wall material exterior curtain wall or ceilings.
- To the extent possible, incorporate the use of high efficiency particulate air (HEPA) vacuums during cleaning at Estabrook.

If disturbed or damaged material is identified prior to or during routine maintenance activities, the PCB Program Coordinator must be contacted immediately.

5.2.2 Housekeeping Activities

Housekeeping activities performed by custodial staff may involve work in areas where PCBs may be present, but not disturbed. Where these instances exist, the employee encountering the material must not contact, disturb, or work on or around the PCBs. The PCB Coordinator or Program Manager will review the work to be done, and ensure that, as warranted, appropriately trained personnel perform the work.

Housekeeping activities may also involve cleaning of the windows, which have encapsulated PCB materials associated with the sealants. Cleaning and other related activities involving these materials shall include utilizing techniques that minimize the potential for damage to the encapsulated surfaces.

6.0 PCB RESPONSE PLAN

It is not anticipated that PCBs will be impacted or damaged during routine work activities at Estabrook; however, if damaged PCB material is observed or if PCB material is accidentally disturbed, appropriate procedures must be followed to assure safety to workers and surrounding occupants.

These procedures should be followed by any Lexington O&M employee or outside service contractor who is notified of, observes, or causes damage to PCB-containing materials, resulting in an unplanned, accidental, or uncontrolled release of PCBs at Estabrook. It is anticipated that the PCB Program Coordinator would typically manage the response activity as outlined below. These procedures call for notification of appropriate personnel and isolation of the affected area in order to minimize potential release until a training individual or outside contractor arrives to clean up and repair the damage.

6.1 NOTIFICATION

If a Lexington employee or outside service contractor is notified of, observes, or causes damage or disturbance to PCB-containing materials in the building, they should immediately notify their supervisor and the PCB Program Coordinator.

6.2 ISOLATE THE AREA

Responding personnel are responsible for isolating the area of the release from adjacent spaces at the direction of the PCB Program Coordinator:

- Segregate and secure the area to prevent unauthorized access.

- Take steps to prevent further disturbance or damage to the material.

- Evaluate the extent of damage or disturbance of the material, the location, and potential for area occupant exposure.

- Coordinate a remediation effort by trained Lexington staff or professional PCB remediation contractor. This may include repair of the damaged material, or clean-up of observed material. This activity may be performed in conjunction with material sampling and characterization. All clean-up or repair activities must be performed in accordance with regulations for removal, handling, and disposal of PCB-containing materials. PCB waste storage containers and labels may be obtained through the transportation and disposal vendor. Labeling and storage requirements will vary with the quantity and type of building material.

7.0 VENTILATION PLAN

The goal of the Heating and Ventilation Systems Sequence of Operations is to recommend an operating procedure that will ensure that any accumulation of PCBs in indoor air of the School during unoccupied/unventilated hours is reduced prior to occupancy. The recommendation is based on information currently available from previous testing; this recommendation may be refined as additional information is obtained through the ongoing mitigation and air sampling program. A copy of the recommended procedure is provided in Appendix E.

Verification of ventilation rates will be conducted four times per year at Estabrook. These measurements will be conducted in February, April, August, and December. If ventilation does not meet requirements outlined in Appendix E, Lexington will conduct the necessary repairs to the HVAC equipment.

Based on the findings of the monitoring and analyses described in the August 29, 2011, memorandum, the O&M Plan will institute the following additional engineering and administrative controls to manage PCB levels at Estabrook during the non-heating season:

- Thermostat set points to minimum position (63 °F)
- Continuous operation of unit ventilators in classrooms
- Continuous operation of central exhaust systems
- Open windows and classroom doors during school hours except when not feasible because of precipitation or cool temperatures

Sampling results indicate that increasing ventilation through a combination of these additional engineering and administrative controls provides further mitigation of PCB concentrations in indoor air of the school over and above the controls described in Appendix E.

8.0 PCB AIR AND SURFACE SAMPLING PLAN

8.1 SITE SPECIFIC CRITERIA

Potential exposure to airborne PCBs shall be controlled to as low as reasonably achievable, and in all cases comply with the current site-specific risk assessment value of 230 ng/m^3.

Potential exposure to PCBs in surface dust shall be controlled to as low as reasonably achievable, and in all cases comply with criterion set forth by the EPA of 10 μg/100 cm^2, as well as a more stringent criteria of 1 μg/100 cm^2 set by the EPA Region 1 PCB Coordinator.

Potential exposure to PCBs on encapsulated surfaces shall be controlled to as low as reasonably achievable, and in all cases comply with the criterion set forth by the EPA of 1 μg/100 cm^2.

Individual sample results greater than seventy-five percent of the site specific criteria will require a follow-up visual assessment of the space to determine if conditions exist that may be contributing to the levels of PCBs in the air or on surfaces. If conditions that may be responsible for any exceedance(s) are identified (e.g., improper ventilation), immediate corrective actions will be taken by Lexington and follow-up sampling will be conducted to evaluate the effectiveness of the corrective actions. In addition to reviewing the data for exceedances of the site specific criteria, the sampling data will be analyzed for spatial trends (e.g., by room or wing), temporal trends (e.g., season), and associations related to temperature and ventilation conditions. Information on ambient temperature during sampling will be used to assist in the interpretation of any occurrences of indoor air PCB concentrations above the action level.

A written report will be issued to EPA upon completion of each round of sampling. All data, quality assurance and quality control data, and supporting documentation will be included in the report. Based on the results, the report will provide the Lexington with specific recommendations as necessary.

8.2 AIR SAMPLING

Air Sampling will be conducted three times per year in February, August, and November. Indoor air samples will be collected at nine locations to characterize potential exposure risks to occupants of Estabrook. Air samples will be analyzed using EPA Method TO-10A for PCB Homolog analysis. Quality assurance and quality control (QA/QC) sampling will include one blank, one duplicate sample, and one ambient (outdoors) air sample.
Analysis and evaluation of the data will be referenced to the published guidelines released by the EPA; the October 20, 2010, Site Specific Risk Assessment; the November 30, 2010, EPA Site Specific Risk Assessment Comments; and the multiple rounds of air sampling data collected throughout Estabrook.

Dates of the air sampling may be adjusted or an additional round or rounds of air sampling may be conducted based on events or work activities in the School.

8.3 SURFACE DUST SAMPLING

Sampling will be conducted three times per year in February, August, and November. Samples will be collected at 10 indoor classroom locations to evaluate potential exposure risks to occupants of Estabrook. Surface samples will be analyzed using EPA Method 8082 with extraction performed by EPA Method 3540C. Quality assurance and quality control sampling will include one blank, one duplicate sample. Prior to collecting samples, visual inspections of representative areas will be completed to note evidence of dust, debris, or the presence of any PCB source material. Sampling will focus on commonly used surfaces such as student desks and work tables. In addition, samples will be collected from surfaces more likely to accumulate dust such as window sills and book shelves.

8.4 SURFACE SAMPLING OF ENCAPSULATED MATERIALS

Sampling will be conducted three times per year in February, August, and November. Samples will be collected at 10 locations to evaluate potential exposure risks to occupants of Estabrook. Surface samples will be analyzed using EPA Method 8082 with extraction performed by EPA Method 3540C. Quality assurance and quality control

sampling will include one blank, one duplicate sample. Prior to collecting samples, visual inspections of representative areas will be completed to note any damage to the surfaces. Sampling will include seven interior encapsulated surfaces and three exterior encapsulated surfaces.

APPENDIX A

CONTACT INFORMATION FOR LEXINGTON EMPLOYEES

CONTACT INFORMATION

Coordinator: Patrick Goddard, Director of Public Facilities

781-274-8958 pgoddard@lexingtoma.gov

Project Manager: Shawn Newell, Assistant Director of Public Facilities

781-274-8960 snewell@lexingtonma.gov

Operations: Ray Drapeau, Facility Superintendent

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Operations: Manny Cabral, Custodial Superintendent

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APPENDIX B

INVENTORY OF IDENTIFIED PCBS AT ESTABROOK

INVENTORY OF IDENTIFIED PCBS AT ESTABROOK

Table B.1 Inventory of PCB-containing Materials at Estabrook Elementary School, 117 Grove Street, Lexington, Massachusetts

Material	Description	Estimated Amount	Encapsulation Status
Window glazing	Material between window glass and metal window frames	6,000 ft	Yes: bond breaker tape and caulking
Ceiling tiles	"Old" ceiling tiles with yellow fiberglass backing	75,000 sq ft	No
Interior panel caulking	Material between curtain wall panels and curtain wall frame	3,000 ft	Yes: mini-wall
Exterior panel caulking	Material between curtain wall panels and curtain wall frame	3,000 ft	Fence
Cove base/ curtain wall	Cover at base of curtain walls	1,200 ft	Yes: mini-wall
Cove base/ curtain wall mastic	Materials between cove base and curtain walls	1,200 ft	Yes: mini-wall
Cove base	Cover at base of walls	–	No
Cover base mastic	Material between cove base and wall	–	No
Exterior frame caulking	Exterior frame caulking has been removed and adjacent materials encapsulated	600 ft	Yes: epoxy and caulking
Interior frame caulking	Caulking between curtain walls and door frames and concrete and brick walls	600 ft	Yes: bond breaker tape, caulking, and mini-wall
Black floor mastic	Floor mastic under tiles	75,000 sq ft	Yes: tiles and floor wax

ft feet
sq ft square feet

APPENDIX C

PCB MANAGEMENT PROGRAM
REVISION HISTORY

PCB MANAGEMENT PROGRAM REVISION HISTORY

Table C.1 Estabrook Elementary School PCBs O&M Plan Revision History

Rev. No.	Effective Date	Description of Change	Author	Approved By
1	06/09/11	Updates made to surface sampling locations and criteria based on EPA comments.	MAF	
2	09/02/11	Refinements to engineering and administrative controls based on July 2011 air sampling and data analysis. Ambient temperature during sampling will be used to assist in the interpretation of any occurrences of indoor air PCB concentrations above the action level.	MAF	

APPENDIX D

REPAIR ACTIVITY
STANDARD OPERATING PROCEDURES

REPAIR ACTIVITY STANDARD OPERATING PROCEDURES

This standard operating procedure (SOP) provides precautionary measures and best work practices that will be followed when conducting a repair or renovation where PCB-containing caulk could be encountered or where assumed PCB materials are present. This SOP is based on information provided by the U.S. Environmental Protection Agency (EPA).[1]

The work practices will employ protective measures during a renovation/repair, leave the work area clean and safe for building occupants, and properly dispose of waste materials. Protective measures will always be used to provide direct personal protection of workers and building occupants, as well as to prevent spreading PCB dust to other surrounding areas.

OCCUPATIONAL PROTECTION

Lexington employees will use suitable personal protective equipment (PPE) for dust-generating work methods. PPE will include; chemical-resistant gloves, Tyvec disposable coveralls and shoe covers, safety glasses or protective goggles, and respiratory protection. In addition, eating, drinking, and smoking will be prohibited in the work area. For work involving significant dust generation, showers and separate changing areas for work clothing and everyday clothing will be provided.

COMMUNICATION WITH SCHOOL OCCUPANTS

Clear communication with all stakeholders (e.g., building occupants, workers, teachers, and community members) will be conducted to create a safe working environment. Affected groups will be informed of: the goals, type, and length of the renovation activities; health and safety aspects of the project; and site access requirements and limitations.

Site security measures will be used to prevent access of unauthorized persons to the work areas until after the final cleanup. Security measures will include: signs, locked doors, barrier tape and/or cones to keep all non-workers, especially children, out of the

[1] http://www.epa.gov/pcbsincaulk/guide/guide-sect2.htm

work area. As needed, trained site personnel will accompany visitors at all times and provide them with appropriate PPE.

WORK AREA SET UP

When working on a renovation or repair job with potential PCB-containing materials, appropriate controls will be put in place to minimize spreading dust during the renovation and/or repair activity. At a minimum, work areas will be protected from non-work areas by constructing containment. Plastic sheeting will be applied to the floor, ground, or other applicable surfaces to prevent contamination of the building interior or exterior from dust generated by the work. Containment will be constructed so that all dust or debris generated by the work remains within the area protected by the plastic. Placing the containment area under negative air pressure will also be used when necessary. Use of high efficiency particulate air (HEPA) filters will be utilized to minimize dust release. The size of the containment area and dust controls that will be used will vary depending on the size of the renovation or repair, the methods used, and the amount of dust and debris that will be generated as a result of the renovation or repair activities. Workers will control the spread of dust outside the work area by vacuuming off Tyvec suits and tools when exiting the work area, removing disposable shoe covers, and wiping or vacuuming shoes so the dust stays inside the work area.

When the job is complete workers will:

- Make sure all trash and debris, including building components, are disposed of properly.
- Vacuum any exposed surfaces, including walls and ceilings, with a HEPA-filtered vacuum cleaner.
- Mist dusty sections of the plastic sheeting with water before taking them down to keep dust from becoming airborne.
- Remove plastic sheeting carefully, by folding it with the dirty side in, taping it shut, and properly disposing of it.
- Vacuum all surfaces again with a HEPA-filtered vacuum cleaner.
- Scrub the work area with a general-purpose cleaner on a wet rag or mop until dust and debris are removed.

- Visually inspect your work to ensure that no dust or debris is present and re-clean the area thoroughly if dust or debris is identified.
- Where required, coordinate surface and/or air sampling of the work area to ensure criteria are maintained.

SMALL RESPONSE TASKS

Small tasks that involve response to a situation such as a broken ceiling tile or window will involve the following response actions:

- Notify the PCB Program Coordinator with details of the required task.
- Isolate the area. Close doors and move furniture in the immediate area if necessary for access.
- Locate the clean-up kit and portable containment apparatus.
- Choose appropriate personal protective equipment.
- Confine and contain any broken materials and position the portable containment apparatus.
- HEPA vacuum dust and small pieces of solid material.
- Remove the ceiling tile or sections of glass inside the portable containment apparatus.
- Damp wipe all surfaces in immediate area.
- Put all contaminated items (gloves, clothing, etc.) into a sealed container or bag.
- Contact PCB Program Coordinator for PCB waste pick-up and disposal.

APPENDIX E

HEATING AND VENTILATION SYSTEMS SEQUENCE OF OPERATIONS

HEATING AND VENTILATION SYSTEMS SEQUENCE OF OPERATIONS

The goal of this sequence of operations is to recommend an operating procedure that will ensure that any accumulation of polychlorinated biphenyls (PCBs) in indoor air of the Estabrook Elementary School (Estabrook) during unoccupied/unventilated hours is reduced prior to occupancy. The recommendation is based on information currently available based on previous testing; this recommendation may be refined as additional information is obtained through the ongoing mitigation and air sampling program.

Review of the heating and ventilation systems sequence of operations indicates the temperature condition needed to maintain the operating minimum outdoor air flow rate through the unit ventilators. Specifically, the temperature in the space needs to be maintained no lower than approximately 1 degree Fahrenheit (°F) of set-point temperature. For example, if the set-point temperature in the space is set for 70 °F, the outdoor air damper on the unit ventilator will not open to the minimum setting until the space is brought to a condition where the temperature in the space is at least 69 °F.[1]

To achieve this condition in the heating season, the boiler will need to be operated during the occupied hours of the school. Environmental Health & Engineering, Inc. (EH&E) recommends that the boiler and Estabrook be set to operate in occupied mode approximately 3 hours before the school will be occupied. This will allow sufficient time for the boiler to build the necessary steam pressure that will allow the unit ventilators to bring the temperature in the space within the range where the outdoor air damper will open to minimum position. Once the damper is in that position, outdoor air will be delivered into the space, which will increase the rate that indoor air is flushed from Estabrook. Exhaust fans serving classrooms should be sequenced to operate with the unit ventilators in the occupied mode. A detailed description of the ventilation sequence is provided in the following section of this Appendix.

Teachers arrive at the building on school days at approximately 7:30 a.m. and programs continue in the building until approximately 6:00 p.m. It is recommend that during the

[1] Personal communications: Shawn Newell of Lexington School Department, William Dempsey of B.D. Control Service, Inc., and Jerry Ludwig of EH&E, August through November 2010.

heating season, the boiler should be operated as required to maintain steam pressure, and the ventilation system be operated in its Winter Occupied Mode, Monday through Friday, 4:30 a.m. through 6:00 p.m. During times when heating is not required, the school should be operated on the same schedule as in the Summer Occupied Mode, during which time the boiler operation is not required.

It is also recommended that a targeted assessment of building ventilation conditions and PCB levels in air during unoccupied periods be performed. This information will be useful for identifying other opportunities to attain the indoor air goals of the Town of Lexington while minimizing natural gas consumption.

SEQUENCE OF OPERATIONS FOR THE CLASSROOM UNIT VENTILATORS

The unit ventilators in the classrooms at Estabrook School operate using a control sequence that has been commonly used in school buildings for over 50 years. This sequence provides a fixed minimum percentage of outdoor air to meet code requirements when the temperature in the space is close to the thermostat set-point temperature. In this case, approximately 350 cubic feet per minute (cfm) of outdoor air will be provided to the classroom when the temperature in the classroom is between 69 °F and 70 °F, (assuming that the thermostat set-point is 70 °F) (see Figure E.1). When the temperature of the space is less than 68 °F, the outdoor air damper will close, and will be fully closed when the temperature in the space is 67 °F or lower. Likewise, as the temperature in the space rises above the set-point temperature of 70 °F, the outdoor air damper will open to allow more outdoor air into the space to cool the space down.[2]

[2] This logic works well when outdoor air temperature is lower than the desired temperature in the space.

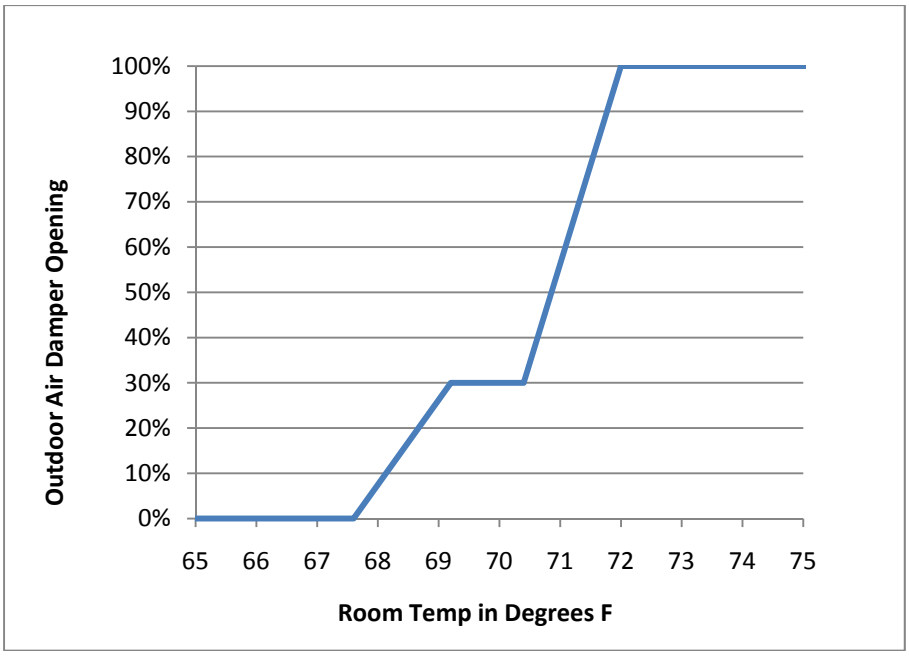

Figure E.1 Position of Outdoor Air Damper of a Classroom Unit Ventilator as a Function of Space Temperature (assuming that space temperature is set for 70 °F)

When the building is in the unoccupied mode, all of the unit ventilators in the building are off and provide no mechanical ventilation of the building. Representative zone temperatures are monitored and will start the boiler and operate the unit ventilators in each classroom of the zone when the zone thermostat senses that the temperature in the zone is less than 60 °F. When this condition is detected, the boiler(s) will fire to provide steam, and the unit ventilators will operate to warm the zones to 65 °F. When the space temperature reaches 65 °F, the boiler and the unit ventilators will again cease to operate. During this un-occupied warm up cycle the outdoor air dampers are still controlled by the logic illustrated in Figure E.1. As the space temperatures remain below 67 °F, the outdoor air dampers will not open and the zone is not provided with mechanical ventilation.

When the building is switched from un-occupied to occupied mode during the heating season, the boiler will fire to provide steam, and the unit ventilators will run to warm the building. As the classrooms warm to 67 °F, the outdoor air dampers will open and begin to ventilate the space at a rate consistent with the minimum occupied code requirement. The exhaust fans will start approximately one-half hour after the unit ventilators to exhaust air from the zone.

The space will be ventilated at this rate until the space temperature exceeds the set-point temperature at which time the outdoor air damper will open beyond the code required minimum position. By the time the temperature in the space reaches 72 °F, the unit ventilator in the space will be providing air that is 100% outdoor air. As the space has many occupants and a significant heat source in lighting, it is not uncommon for the space to heat beyond set-point temperature, even when outdoor air temperatures are around 20 to 30 °F. In this operating condition the classroom unit ventilator is actually cooling the space to prevent overheating. To avoid localized drafts in the vicinity of the unit ventilator, the unit ventilator will not discharge air that is less than 57 °F. While this may feel cold if sensed directly at the unit ventilator, the unit ventilator is working as designed. For this reason, it is advisable that desks of occupants not be situated in close proximity of the unit ventilator.

When the building is switched from unoccupied to occupied mode in the cooling season the unit ventilators will come on to cool the building. If the classroom space has a temperature greater than the space set-point (70 °F), the unit ventilator will provide more than the code required minimum percentage of outdoor air in an attempt to cool the space with outdoor air.

When outdoor air is warmer than the desired space temperature, outdoor air will be brought in at a rate that exceeds the code requirements. While it may not sufficiently cool the space to achieve set-point temperature, it will still be cooling the space; as the temperature indoors will have additional heat sources that are not outdoors such as lights, and the metabolic heat of the occupants.